

Brachytherapy as a treatment option for prostate cancer: overview and nursing considerations

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According to the American Cancer Society, prostate cancer is the most common form of cancer in men and is second only to lung cancer as a cause of cancer-related death in men. A number of treatment options are available to men diagnosed with prostate cancer, including watchful waiting, hormonal therapy, surgery, and radiation therapy. Brachytherapy, a form of radiation therapy available for the treatment of localized disease, is the focus of this article.

Brachy is a Greek prefix meaning “short.” Brachytherapy is treatment at a short distance. In the treatment of prostate cancer, it designates the use of radiation therapy in which radioactive material, in the form of “seeds,” is implanted directly into the prostate. A fundamental advantage of prostate brachytherapy over external beam therapy is that dose delivery can be increased with a sharp attenuation gradient beyond the target volume, thus sparing normal structures.

HISTORY

Brachytherapy is one of the oldest techniques using radiation therapy for the treatment of prostate cancer. Early information on this procedure dates back to 1911, when Pasteau published his report describing the simple insertion of radium into the prostatic urethra via a catheter. In 1917, Barringer implanted the prostate gland with radium needles. In 1922, Denning published a series of case histories using this technique (1). This method of treatment was successful for the short term, yet the complications affecting 15% to 20% of patients were significant. Efforts in the 1970s to 1980s were limited by the lack of technology to precisely place the seeds in the prostate. The placement of the seeds did not provide a homogenous dose of radiation to the tumor. Without the benefit of modern imaging techniques, accurate placement of the radioactive seeds was impossible to achieve.

PATIENT SELECTION

Brachytherapy is an option for the treatment of T1 and early T2 prostate cancer. Because of the nature of the treatment, it may be the procedure of choice for older patients. Patient selection criteria for brachytherapy are similar to those used for prostatectomy: candidates must be considered low risk for locally extensive or disseminated disease. Contraindications may include an earlier transurethral resection of the prostate, poor general health, obesity, bowel disease, previous abdominal surgery, pubic arch interference, and urinary retention (2). This treatment

can be used alone or in conjunction with other treatment regimens, such as external beam radiation and hormonal therapy.

ISOTOPES

Palladium 103 (^{103}Pd) is one of the radioactive isotopes used in the brachytherapy treatment. Its relative biological effectiveness is higher than that of iodine 125 (^{125}I). In addition, the steep dose falloff allows for greater tumor eradication while sparing normal cells. The energy of the emitted radiation from palladium seeds is high enough to deliver an efficient tumoricidal dose to the prostate while sparing the nearby organs.

^{125}I has an initial dose rate of approximately 7.5 cGy/hr and a half-life of 60 days compared with ^{103}Pd , which has an initial dose rate of 21.5 cGy/hr and a half-life of 17 days (3). ^{125}I delivers about half of its radioactivity within 2 months. After 1 year the radioactivity will be dispersed.

PREPROCEDURE TESTING

The perioperative experience for the patient begins when he is scheduled for the treatment. Prior to the permanent seed implant, a transrectal ultrasound examination is done to determine the shape and size of the prostate. Prostate size >60 grams can be a significant factor in optimal treatment planning and delivery. During the ultrasound, dosimetry is used to create a specialized plan for each patient. Dosimetry consists of dose calculations and distribution measurements done in radiation therapy. With these tools, the radiation oncologist can calculate the number of seeds needed and appropriate placement for maximum benefit (*Figure*). Additionally, the tools help the physician spare critical structures such as the rectum and the urethra. While the active material is usually referred to as seeds, it is composed of tiny (4.5-mm) titanium cylinders about the size of a straight pin. Generally, about 70 to 150 seeds are placed into the prostate gland.

Other preprocedure tests include routine blood work—blood clotting function, basic chemistry panel, and complete blood count—a urine culture, a chest x-ray, and an electrocardiogram.

The patient is asked to discontinue medications containing aspirin and ibuprofen 7 to 10 days before the implant, to follow

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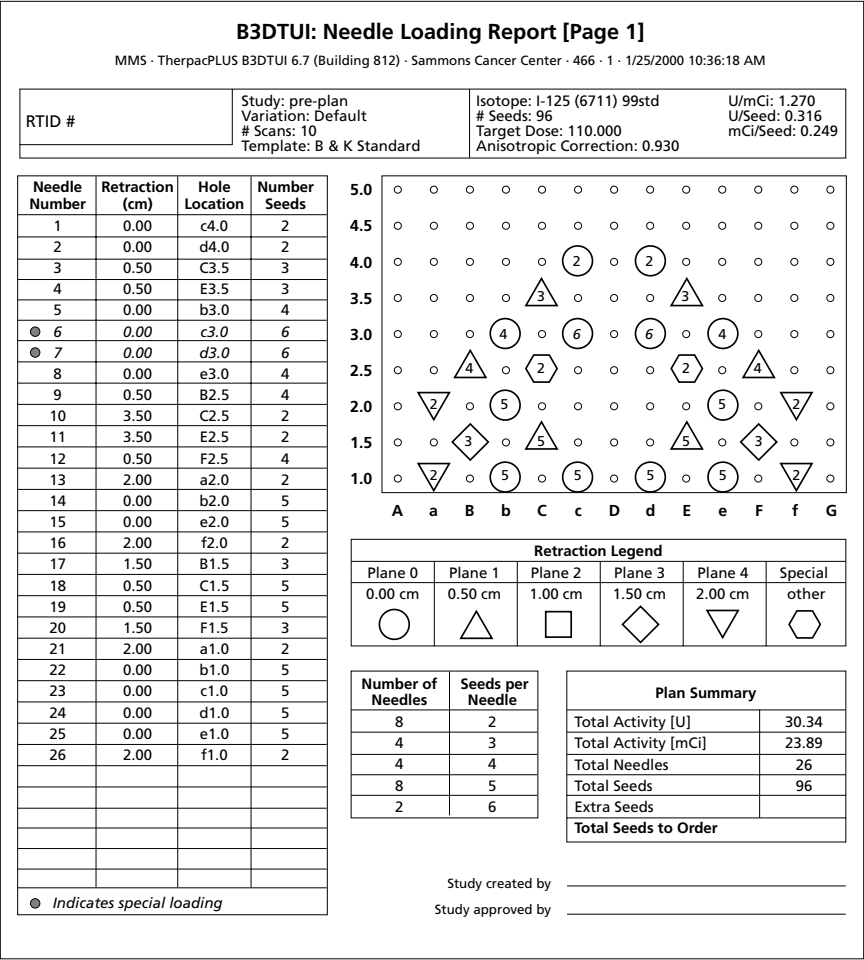


Figure. Needle-loading report for brachytherapy prepared during the preprocedure ultrasound by a dosimetrist and radiation oncologist.

a liquid diet the day before the procedure, and to abstain from food and drink after midnight before the procedure. An enema or suppository is used to clear the fecal matter from the lower bowel so that the ultrasound images of the prostate will be clear. The perineal area may be shaved prior to the procedure.

THE PROCEDURE

At Baylor University Medical Center, brachytherapy is scheduled in a designated cystoscopy room within the operating room suite. As with any surgical procedure, the anesthesia provider assesses the patient’s overall status preoperatively. The type of anesthesia available, spinal or general, is discussed with the patient and the appropriate choice is made. The perioperative registered nurse, using the standard nursing practice, interviews the patient in the preoperative anesthesia holding area before taking the patient to the operating room.

After the patient is taken to the operating room, the nurse positions him in the dorsal lithotomy position: lying on his back, with legs raised and pelvis flexed. Once anatomical alignment is verified, the patient’s skin is prepared with antimicrobial solution, and the ultrasound probe is stabilized on the operating room bed, the physician inserts the probe in the rectum to the level of the prostate. The physician then makes use of the perineal grid template developed during the ultrasound. This template consists of a pattern of holes in relation to numbers and

letters that is printed on a prostate seed plan, forming a “road map” to ensure the proper placement of the stainless steel needles (trocars) (Figure). When the needles are appropriately placed, the seeds, which have been preloaded, are inserted. After the seeds are implanted, the needles are withdrawn.

Fluoroscopy is used to confirm correct placement of the seeds during the procedure and to show how the case is proceeding. A cystoscopy may be done postoperatively to verify the absence of any seeds in the bladder and to check for any bleeding in the bladder caused from insertion of the seeds.

A closed urinary drain system is placed in the bladder. The perioperative nurse cleans the patient’s perineal area and applies a dressing. Postoperatively, the nurses monitor the perineum for signs of bruising; monitor and record intake and output; verify the patency of the urinary catheter; collect urine and strain it overnight; and monitor bowel movements. Pain management is an important part of care. The patient is kept comfortable with analgesics administered according to the physician’s order. Early ambulation is encouraged. The nurses also evaluate the outcomes based on the criteria that support a standard of care in this population.

POTENTIAL SIDE EFFECTS

The patient may experience acute side effects from the radiation, which include urine retention due to swelling from the procedure or radiation, radiation urethritis, and prostatitis. There may be slight bleeding under the scrotum where the needles were placed. These potential side effects will decrease as the seeds lose their potency. There is a small chance of long-term or permanent side effects

Table. Radiation safety checklist*

Objective	For how long
Ensure that family and visitors >45 years of age maintain a distance of ≥3 feet from you at all times.	
Visits should not be longer than 2 to 3 hours.	3 to 6 days
Keep a 6-foot distance from pregnant women.	2 months
Do not hold infants on your lap.	2 months
Sleep alone, if possible.	2 months
If you find a seed, pick it up with tweezers and place it in the container provided.	2 months
Abstain from intimacy and sexual relations.	2 weeks
Use condoms.	2 months

If you have any questions or concerns, contact your physician.

*Modified from reference 4.

from this treatment, although as many as 20% of patients describe dysuria at 1 year (4). Many of the patients treated with brachytherapy are in an older age group and may have noticed a decreased sexual potency before the therapy.

Educational material is essential in helping the patient and his family understand the side effects of the procedure and the radiation precautions necessary. The patient is discharged with verbal instructions and a written radiation safety checklist, which includes instructions to family members and visitors concerning radiation precautions (*Table*). Among the general instructions given to the patient are to avoid heavy lifting or strenuous physical activity for a few days postoperatively, to take over-the-counter pain medications, and to watch for persistent bleeding or the passage of blood clots.

CONCLUSION

Brachytherapy for early stage prostate cancer, which is confined to the gland, is well tolerated by the patient and offers the least morbidity, shortest hospital stay, shorter recovery time, and—some reports show—the least expensive method of treatment (5).

Yale University School of Medicine reported a low incidence of adverse effects in a study of 992 patients implanted with ¹²⁵I seeds compared with other treatment modalities (6). The incidence of reported side effects should be considered with the probability of disease-free survival. It is too soon to know whether brachytherapy is a curative treatment.

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